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Statement
of
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before the

Committee on Science
House of Representatives

Mr. Chairman and Members of the Committee, I appreciate the opportunity to appear before the Committee today to discuss the President's FY 2004 budget proposal of \$15.47 billion for NASA. The President's request demonstrates the Administration's continued confidence in NASA's ability to advance the Nation's science and technology agenda.

We come together to discuss NASA's space research and exploration agenda, and our efforts to advance aviation safety and efficiency in this Centennial of Flight year, still mourning the tragic loss of the courageous crew of the Space Shuttle *Columbia*. Before I discuss the details of the budget, I would like to provide the Committee an update about the on-going investigation.

Today, 26 days after the tragic loss of *Columbia*, our work continues to honor the solemn pledge we've made to the families of the astronauts and to the American people that we will determine what caused the loss of *Columbia* and its crew, correct what problems we find, and safely continue with the important work in space that motivated the *Columbia* astronauts and inspires millions throughout the world.

Since I last appeared at the joint hearing between this Committee and the Senate Commerce Committee on February 12, the independent Columbia Accident Investigation Board under Admiral Gehman has made significant progress in organizing its work to determine the cause of the accident. NASA has kept its pledge to fully cooperate with the work of the Board, and has taken the necessary steps to ensure the Board's complete independence.

Recovery operations, which began as soon as it became clear that *Columbia* was lost, continue on the ground in places along the Shuttle's reentry path, stretching from San Francisco, California to Lafayette, Louisiana, where we hope to recover more vital debris from the accident. We continue to send everything we find to the Kennedy Space Center in Florida for assembly and analysis as part of the Columbia Accident Investigation Board's comprehensive accident investigation.

The careful search for debris will continue in the weeks ahead, with our best opportunity to find remaining debris occurring in the next few weeks before the spring growing season begins. As I stated during the joint committee hearing on February 12, NASA is deeply grateful for the support we have received during recovery operations from more than 2000 men and women from

the Department of Homeland Security, Federal Emergency Management Agency, Environmental Protection Agency, Federal Bureau of Investigation, Department of Defense, Department of Transportation, U.S. Forest Service, U.S. Park Service, Texas and Louisiana National Guard, and state and local authorities who have helped us locate, document, and collect debris.

Implications of Suspension of Shuttle Flights

Mr. Chairman, you specifically requested that I address the implications of suspension of Shuttle flight for other programs, including the International Space Station (ISS), Hubble Space Telescope, and plans for the Orbital Space Plane Program. You also asked that I address near- and long-term contingency planning for the ISS. I will provide a brief summary, and am prepared to discuss the status with you in detail today, and in the weeks and months ahead.

With respect to the ISS, the Expedition 6 crew--Commander Ken Bowersox, Science Officer Donald Pettit and Cosmonaut Flight Engineer Nikolai Budarin--continue to perform science while performing routine ISS maintenance on orbit. There are no threats to the ISS or its crew in the near term, and we are working options to be able to sustain both over the long term. All remaining U.S. manufactured ISS hardware for the Core Complete configuration has been delivered to KSC and element ground processing is on schedule. Delivery of Node 2, built for NASA by the European Space Agency, is on schedule for April 2003. Ground processing will continue until ready for Shuttle integration. Only one ISS mission, STS-118, in the critical path to U.S. Core Complete was manifested on Columbia. The primary mission objective of STS-118 is the transfer and installation of the S5 Integrated Truss assembly to the S4 Truss. While the manifest for the remaining three Orbiters will need to be adjusted to accommodate this flight, all other previously scheduled ISS assembly missions will be flown in their original order. A revised U.S. Core Complete assembly schedule will be confirmed when the Shuttle is ready to return to flight status.

With respect to the Hubble Space Telescope (HST), NASA can continue to service it, and any Orbiter is capable of supporting HST servicing missions. Furthermore, the HST is performing well, and is a robust observatory in no immediate need of servicing. Should a delay in the planned servicing mission (November 2004) occur that impacts the Telescope's ability to perform its science mission, HST can be placed in safe mode until a servicing mission can be arranged.

With respect to the Orbital Space Plane Program (OSPP), I am pleased to report that NASA recently released the OSPP Level One Requirements. The OSPP Mission Needs Statement directs that the OSPP vehicle(s) and associated systems shall support U.S. ISS requirements for crew rescue, crew transport, and some cargo. The requirements mandate that the system, which may include multiple vehicles, shall provide rescue capability for no fewer than four ISS crew as soon as practical but no later than 2010. The requirements also state that the system shall provide transportation capability for no fewer than four crew to and from the ISS as soon as practical but no later than 2012. These requirements, drafted prior to the loss of Columbia, already reflect schedule urgency. Immediately following the Columbia tragedy, an inter-Center team was convened to consider options to responsibly accelerate the program while still addressing NASA's requirements.

In the absence of Space Shuttle support, NASA is addressing contingency requirements for the ISS for the near- and long-term. As I said earlier, there is no immediate danger to the Expedition 6 crew. In order to keep the crew safe, however, we must ensure that they have sufficient consumables, that the ISS can support the crew, and that there is a method for crew return available. Working closely with our international partners, we have confirmed that there is

sufficient propellant on-board the ISS to maintain nominal operations through the end of this year. With the docking of the Progress re-supply spacecraft on February 4 (ISS Flight 10P), the crew has sufficient supplies to remain on the ISS through June without additional re-supply. As we move beyond June, however, potable water availability becomes the constraining commodity. We are currently working closely with our Russian partner, Rosaviakosmos, to explore how best to address this issue on future near-term ISS re-supply missions. A Soyuz spacecraft (ISS Flight 5S) is docked to the ISS and serves as a rescue vehicle for crew return in the event of a contingency. These Soyuz spacecraft have an on-orbit lifetime limitation of approximately 200-210 days, and must be replaced periodically. The Soyuz 5S vehicle will reach its lifetime limit in late April/early May, and will need to be returned.

We are currently evaluating strategies with our International Partners to keep the ISS crewed and supplied with sufficient consumables, and to replace the Expedition 6 Crew. The ISS Partnership is committed to maintaining crew on-orbit. To address the near-term anticipated shortfall in potable water, one of the strategies that NASA and its partners are considering is bringing up a new crew of two (one U.S. and one Russian) on the next Soyuz spacecraft (ISS Flight 6S), scheduled for launch in late April, to replace the Expedition 6 Crew of three. We are also working closely with Rosaviakosmos to evaluate the flexibility and constraints of the Progress flight schedule to support the crew.

In the unlikely event that de-crewing is required, the ISS can be configured and de-crewed using established contingency procedures. The ISS can remain without a crew for an extended period of time while maintaining altitude with Progress and onboard re-boost capability, without crew interaction. NASA will continue to meet its commitments to our ISS International Partners. Once we understand what caused the Columbia accident and can return to flight, we will resume assembly of the ISS.

The ISS, now in its third year of human occupancy, represents an important milestone in history. Due to this capability, humans are now able to permanently occupy the realm outside of Earth and are actively conducting ambitious research spanning such scientific disciplines as human physiology, genetics, materials science, Earth observation, physics, and biotechnology.

FY 2004 Budget Request

On that sunny Saturday morning, February 1st, as I awaited the landing of the Columbia, I was contemplating my return to Washington, D.C., to prepare for the release of NASA's FY 2004 budget. We had worked aggressively over the past year to develop a new Strategic Plan and fashion a budget to make it a reality. I was excited about announcing these plans with the release of the President's FY 2004 Budget in two days. I had no idea how that tragic morning would change my focus over these ensuing weeks. During the days that followed, I was asked by some whether the Columbia accident would force us to toss aside our budget and long-range plans. Mr. Chairman, I will tell you as I told them, I think not. A test of any long-term plan is whether it can accept the inevitable setbacks and still achieve its goals. That is my hope for our plan.

Mr. Chairman, in light of the recent tragic loss of *Columbia*, we must recognize that all exploration entails risks. In this, the Centennial Year of Flight, I am reminded of an accident that occurred just across the river at Ft. Myer in 1908 onboard the Wright flyer. The Wright brothers were demonstrating their flying machine to the U.S. Army, and a young lieutenant was riding as an observer. The flyer crashed, and Lt. Thomas Selfridge died of head injuries, thus becoming the first fatality of powered flight. From that accident in 1908 came the use of the crash helmet. So too from *Columbia* we will learn and make human space flight safer.

Although the budget proposal was prepared prior to the loss of *Columbia* and its crew, I am convinced that NASA's FY 2004 budget proposal is responsible, credible, and compelling. It is **responsible** by making sure that our highest priorities are funded; it is **credible** by ensuring that adequate budget is built into the most technically challenging programs, and that we will fully account for the costs of all our programs; and, it is **compelling** by allowing NASA to pursue exciting new initiatives that are aligned with our strategic objectives. As I mentioned previously, the President's FY 2004 budget request for NASA is \$15.47 billion. While I will not rule out potential adjustments to this proposal that may be appropriate upon completion of the independent Gehman Board investigation, I look forward to discussing the FY 2004 budget request and how it advances our mission goals of understanding and protecting the home planet, exploring the Universe and searching for life, and inspiring the next generation of explorers, and, in so doing, honoring the legacy of the *Columbia* astronauts.

Establishing Our Blueprint

Today's discussion is about more than changes in the budget – which is usually just a discussion over how one might change a few percent of one's budget from the year to year – but instead it is about a new strategic direction for NASA and how we are planning to shift our resources toward our longer-term goals. In April 2002, I gave a speech at the Syracuse University that espoused a new Vision and Mission for NASA. There are only 13 words in NASA's Vision and 26 words in NASA's Mission, but every word is the product of extensive senior leadership debate within NASA. And what you see in our new Strategic Plan is the product of those discussions, and the product that the entire NASA team is committed to delivering for the American people. Indeed, we did not need to release this Strategic Plan with our budget – after all, the law stipulates September 2003 – but we felt that if we are serious about our Vision and Mission, we must have it during our budget deliberations and release it simultaneous with our budget.

NASA's strategy for the future represents a new paradigm. In the past, we achieved the marvel of the moon landing, an incredible achievement that has shaped much of NASA today, driven by a great external event – the Cold War – that allowed our Nation's treasury to be aggressively spent on such a goal. Today, and in the decades since Apollo, NASA has had no comparable great external imperative. This, however, does not mean that we cannot lift our eyes toward lofty goals and move up the ladder – using the **stepping stones** we have identified. We believe that we can make great strides in our exploration goals – not on some fixed timescale and fixed location – but throughout our solar system with ever more capable robotic spacecraft and humans to enable scientific discovery. Hence, we will not be driven by timeline, but by science, exploration, and discovery. We will pursue **building blocks** that provide the transformational technologies and capabilities that will open new pathways. We can do this within our means. And if someday there is an imperative or new discovery that pushes us further, we will be ready and well along the way.

To be successful, we will transform ourselves as follows:

- All investments will contribute to our goals and traceable to the Vision and Mission. Every NASA program and project must be relevant to one or more of the goals, and perform successfully against measures.
- Human space flight capabilities will be enhanced to enable research and discovery. We will continue to expand human presence in space -- not as an end in itself, but as a means to further the goals of exploration, research, and discovery.

- Technology developments will be crosscutting. We will emphasize technologies with broad applications, such as propulsion, power, computation, communications, and information technologies.
- Education and inspiration will be an integral part of all our programs. We will track performance of our education programs like that of any other NASA activity.
- We will operate as One NASA in pursuit of our Vision and Mission. We will reinforce the shared commitment of all NASA employees to our common goals.
- As Only NASA Can: We will pursue activities unique to our Mission -- if NASA does not do them, they will not get done -- if others are doing them, we should question why NASA is involved.

Strengthening our Foundation

This building block and stepping stone approach already has one important brick in place: the FY 2003 Omnibus Appropriations Act, signed by the President on February 20. The FY 2003 appropriation contains many of the needed elements that will help NASA address important constraints in power, transportation, and human capabilities. The FY 2003 budget contains funding for NASA's:

- *Nuclear Systems Initiative* to develop new power and propulsion technologies that will enable solar system exploration missions that are inconceivable with current conventional chemical propulsion systems. This initiative has been incorporated in *Project Prometheus* as part of our FY 2004 Budget request.
- *International Space Station (ISS)*, including full funding to assure we can successfully reach the milestone of U.S. Core Complete—which will enable accommodation of International Partner elements--maintain progress on long-lead items for enhanced research, and continue to build out this research laboratory platform for overcoming human limitations in space. It also includes authority to proceed with establishment of a Non-Governmental Organization (NGO) for ISS research. This funding and authority builds on our major achievements over the past year. We have received endorsements by two independent cost teams that deemed the program's cost estimates as "credible" and the ISS Management and Cost Evaluation (IMCE) independent task force, chaired by Tom Young, that commended our progress against their recommended management reforms. We have revamped our science program towards the highest priority research as identified by the Research Maximization and Prioritization (ReMAP) independent task force. We have put in place a new management team to control program content, ensure science requirements are met, and refocus program from development to operations. Finally, we are implementing new financial management tools to better manage our resources.
- *Integrated Space Transportation Plan (ISTP)* that will address our Nation's near and mid-term requirements in human space flight by making investments to extend the Shuttle's operational life for continued safe operations; developing a new Orbital Space Plane to provide a crew transfer capability as early as possible to assure access to and from the International Space Station; and, funding next-generation launch vehicle technology in such areas as propulsion, structures, and operations. Since providing our ISTP as part of the FY 2003 budget amendment in November 2002, we have moved out aggressively on this roadmap. We are refining the Shuttle's Service Life Extension Program to better identify priorities and long-term investments. We also have completed top-level requirements for the Orbital Space Plane and awarded contracts to address priority technologies and areas of risk. Finally, we are refining our investments in long-term launch technologies as part of our

recently initiated space architecture activities. We believe the ISTP is a good plan, but we are committed to re-examining it if necessary in light of future investigation findings on Columbia.

We must ensure that we have a sound foundation -- our people, processes, and tools -- from which to build our programs. It is only from such a sound foundation that we can go forward to more ambitious plans. We have placed the highest priority on achieving the goals of the President's Management Agenda, which contain five Government-wide initiatives that promise to significantly improve our management foundation:

- *Human Capital*: We have begun to implement our strategic human capital plan, including a tracking system to identify workforce deficiencies across the Agency. I will address this very important issue at the conclusion of my remarks.
- *Competitive Sourcing*: We have achieved the government-wide, 15 percent competitive sourcing goal, and are pursuing, wherever feasible, new opportunities for competition, including the renewal of contracts.
- *Financial Performance*: We have addressed all issues contained in the disclaimer opinion on NASA's 2001 audit and been given a clean opinion for 2002.
- *E-Government*: We are addressing information technology security issues and reviewing and enhancing other IT capabilities.
- *Budget & Performance Integration*: We are budgeting for the full cost of NASA's programs and have integrated our budget and performance plan starting with FY 2004 Budget.

Mr. Chairman, I would like to specifically highlight NASA's newest Enterprise, Education. The Education Enterprise was established in 2002, to inspire more students to pursue the study of science, technology, engineering and mathematics, and ultimately to choose careers in those disciplines or other aeronautics and space-related fields. The new Enterprise will unify the educational programs in NASA's other five enterprises and at NASA's 10 field Centers under a One NASA Education vision. NASA's Education vision will permeate and be embedded within all the Agency's activities.

Linking Investments to Strategic Plan

Simultaneously with the submission of the President's FY 2004 budget request, we submitted to the Congress the Agency's new Strategic Plan, our Integrated Budget and Performance Document, and our Performance and Accountability Report. I believe the sweeping changes we are proposing in our FY 2004 Budget represent the most ambitious in our history and will enable us to vastly improve our ability to align our investments with our goals, assess progress, and make sound economic and technical decisions based on accurate and timely information. These improvements include:

- *Budget Restructure* – In response to our new Strategic Plan, we have restructured our budget. NASA's new Strategic Plan recognizes that we are organized by those Mission-driven activities that deliver our end products—Space Science, Earth Science, Biological and Physical Research, Aeronautics, and Education—and by those activities -- International Space Station, Space Shuttle, Space Flight Support, and Crosscutting Technology -- that enable our Mission-driven activities to succeed. To mirror the organization of activities in our Strategic Plan into mission-driven efforts and supporting capabilities, and to recognize the reality that there is no arbitrary separation between human and science activities, the FY 2004 budget replaces the previous structure with two new appropriation accounts: *Science, Aeronautics and Exploration*; and, *Space*

Flight Capabilities. For FY 2004, the request includes \$7.661 billion for *Science, Aeronautics and Exploration* and \$7.782 billion for *Space Flight Capabilities*.

Furthermore, the budget is structured in 18 goal-oriented *Themes*, which aggregate programs to be managed as a business portfolio in pursuit of common goals and performance measures.

- *Full Cost Accounting and Management* – In a landmark event, we have allocated all our costs by program areas. Throughout our history, NASA has treated the cost of institutional activities (personnel, facilities, and support) separate from the programs they benefit. This has made economic trades difficult to analyze. In this budget, we have placed all costs against programs so that, for the first time, we can readily determine the true total costs of programs and allow managers to make more efficient and effective choices.
- *Integrated Budget and Performance Document* – We have revamped our Congressional justification with a new document that merges our restructured budget with our performance plan. The document highlights the 18 themes and associated performance measures. Moreover, it clearly identifies projects approved for full scale development, including promised cost, schedule, and technical parameters.
- *Integrated Financial Management System* – After a decade of trying, we are successfully bringing online a new integrated financial management system. For the first time in the agency's history, we will have one financial system for all our Field Centers, a major step in our *One NASA* goal. The core financial module will replace the legacy systems at all our Centers by this summer. This new system implementation is critical for enabling successful management of the budget, cost, performance, and the accounting changes mentioned above. Moreover, this new system will significantly enhance our ability to maintain a clean financial audit opinion.

Pursuing Critical New Opportunities

At NASA, we are developing *building blocks* that open new pathways of exploration and discovery. Today, our telescopes peer billions of years into the past to witness the beauty and unlock the mysteries of the early universe. Our satellites view the entire planet from space, allowing us to study global change and its consequences for life on Earth. Our spacecraft travel throughout the solar system and into the uncharted territories beyond, exploring the processes that have led to the incredible diversity of the planets and the emergence of life. Our aeronautics research has given people the routine ability to travel safely and reliably all around the world. Our astronauts are living and working in space, and from them, we are learning how to expand our sphere of exploration far beyond the bounds of Earth.

But, our ability to fully achieve our Mission is constrained by the need for new technologies that can overcome our current limitations. We must provide ample power for our spacecraft as well as reliable and affordable transportation into space and throughout the solar system. We must deploy innovative sensors to probe Earth, other planets, and other solar systems. We must be able to communicate large volumes of data across vast distances, so that we can get the most from our robotic explorers. And we must learn to mitigate the physiological and psychological limitations of humans to withstand the harsh environment of space.

To address these and other challenges, we must build upon the strategic investments we are making in the FY 2003 Budget and pursue critical new opportunities. Consequently, our FY 2004 Budget request includes nine new initiatives:

- *Project Prometheus* will use breakthrough nuclear propulsion and power systems to fuel an ambitious mission to Jupiter's icy moons, which astrobiologists believe could harbor organic material, and lay the groundwork for even more ambitious exploration missions in the coming decades. The FY 2004 budget request includes \$93 million for this initiative, and \$2.07 billion over five years.
- *Human Research Initiative* will conduct biomedical research and develop technologies to enable safe and efficient long-duration space missions, including potential future missions beyond low-Earth orbit. This initiative will provide knowledge and technology for efficient life support on the ISS, and has potential medical benefits for millions here on Earth. The FY 2004 budget request includes \$39 million for this initiative, and \$347 million over five years.
- *Optical Communications Initiative* will invest in revolutionary laser communications technologies that will allow planetary spacecraft to transmit large volumes of scientific information, and will be demonstrated on a Mars mission in 2009. The FY 2004 budget request includes \$31 million for this initiative, and \$233 million over five years.
- *Beyond Einstein Initiative* will launch two Einstein Observatories: LISA (Laser Interferometer Space Antenna), a deep-space-based gravity wave detector that will open our eyes to the as-yet-unseen cosmic gravitational radiations; and Constellation-X, a mission that will tell us what happens to matter at the edge of a black hole. In addition, the FY 2004 budget request provides funding to initiate Einstein Probes, three spacecraft that will answer: "What powered the Big Bang?" (the *Inflation Probe*); "How did black holes form and grow?" (the *Black Hole Finder Probe*); and, "What is the mysterious energy pulling the Universe apart?" (the *Dark Energy Probe*). The FY 2004 budget request includes \$59 million for this initiative, and \$765 million over five years.
- *Climate Change Research Initiative* is an interagency effort to accelerate research targeted at reducing key scientific uncertainties to help the Nation chart the best course forward on climate change issues. The FY 2004 budget request includes \$26 million for this initiative, and \$72 million over five years.
- *Aviation Security Initiative* will develop technologies to help reduce the vulnerability of aviation to terrorist and criminal attacks. The FY 2004 budget request includes \$21 million for this initiative, and \$225 million over five years.
- *National Airspace System Transformation Augmentation* will accelerate the development of technology to help address efficiency, capacity and security needs. The FY 2004 budget request includes \$27 million for this initiative, and \$100 million over five years.
- *Quiet Aircraft Technology Acceleration* will develop technology to help significantly reduce community noise impact and achieve significant savings in amelioration programs. The FY 2004 budget request includes \$15 million for this initiative, and \$100 million over five years.
- *Education Initiative* includes funding for NASA's Educator Astronaut Program, NASA Explorer Schools, NASA Explorer Institutes, and Scholarship for Service. The FY 2004 budget request includes \$26 million for this initiative, and \$130 million over five years.

While there have been additional funding provided to NASA's previous five-year budget runout to provide for these new initiatives, the balance of the funds for the initiatives has resulted from reprioritization of future funding to more appropriately pursue the Agency's Vision/Mission and goals. These initiatives will plant the seeds to enable future achievements. From them, we will continually advance the boundaries of exploration and our knowledge of our home planet and our

place in the universe. We seek answers along many paths, multiplying the possibilities for major discoveries. The capabilities we develop may eventually enable humans to construct and service science platforms at waypoints in space between Earth and the Sun. Someday, we may use those same waypoints to begin our own journeys into the solar system to search for evidence of life on Mars and beyond.

Mr. Chairman, as I indicated above, there is one additional point I wish to make. I would like to briefly discuss the state of our workforce, the lifeblood of this Agency. Last year, NASA submitted to the Congress a series of legislative proposals to help the Agency reconstitute and reconfigure our workforce. These provisions, for the most part, mirrored tools contained in the President's proposed Managerial Flexibility Act, and three of them have since been enacted on a Government-wide basis in the Homeland Security Act. We have worked extensively with this Committee to refine the remaining proposals, and we appreciate all the Committee's efforts to date. NASA's workforce is an aging workforce. At the time of Apollo 17, the average age of the young men and women in Mission Control was 26 years; today, we have three times as many personnel over 60 years of age as under 30 years of age. Since 1999, there have been at least 18 studies and reports concerning the workforce challenges facing NASA. Within five years, nearly 25 percent of NASA's current workforce will be eligible to retire. The potential loss of this intellectual capital is particularly significant for this cutting-edge Agency that has skills imbalances. I strongly solicit the support of the Committee to ensure expeditious enactment of this critical legislation.

Appended to my testimony, as Enclosure 1, is a chart displaying NASA's FY 2004 five-year budget request. Also appended, as Enclosure 2, is a summary of the significant progress that NASA has made in the past year on a number of important research and exploration objectives, and a detailed summary of NASA's FY 2004 budget request.

The Columbia accident has reminded me that we cannot stop dreaming. We cannot stop pursuing our ambitious goals. We cannot disappoint future generations when we stand at the threshold of great advances. Mr. Chairman, I believe that NASA's FY 2004 budget request is well conceived and worthy of the favorable consideration by the Committee. I am prepared to respond to your questions.